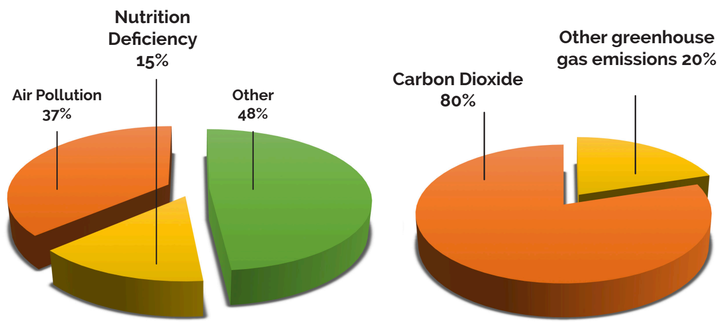
DESIGN TO COMBAT THE EFFECTS OF GREENHOUSE GASES AND POLLUTION

ABSTRACT

Global warming is caused by the greenhouse gas effect.



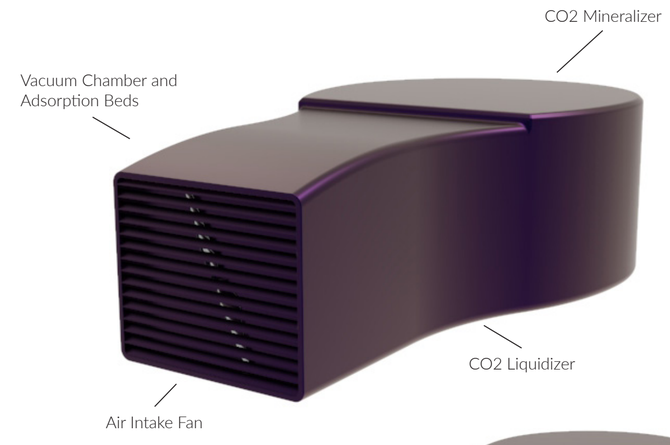
This effect has created a global crisis that has caused the planet to rise in temperature and disrupt life on Earth. The largest contributor of the greenhouse gases is Carbon dioxide (CO2). CO2 lingers in the atmosphere and absorbs infrared radiation from the sun. The causes of CO2 being released in the atmosphere is due to transportation, energy, agriculture, and major industries. The rate in which we pollute and emit carbon dioxide into the air increases every year. Many industries release CO2 in their daily operations and contribute to the problem of global warming. In particular, the agricultural industry releases CO2 by burning crops for fertilization of soil. This poster introduces a novel product that utilizes the direct air capturing (DAC) process to create calcium carbonate for agricultural industries.

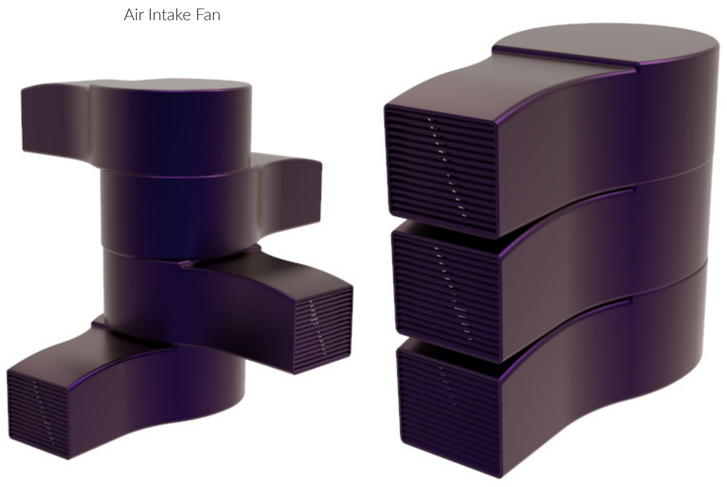
"Using Direct Air Capture we will redeploy CO2 from the atmosphere into calcium carbonate for a variety of uses."

Direct Air Capture (DAC) is the process of capturing carbon dioxide (CO2) directly from atmospheric air (US 2017/0106330 A1, n.d.). DAC is a very appealing method of carbon capturing and is considered to be one of the best methods of achieving negative CO2 emissions worldwide (Wilcox, Psarras, & Liguori, 2017). Opportunities for CO2 utilization include enhanced oil recovery, carbon mineralization, urea production, food and beverage, polymer processing, microalgae production, liquid fuels, and enhanced coal bed methane recovery (Wilcox, Psarras, & Liguori, 2017). The benefit of using DAC technology to clean CO2 is that it can be placed anywhere.

GAEA

CO2 capturing device





SOLUTION

RIACT

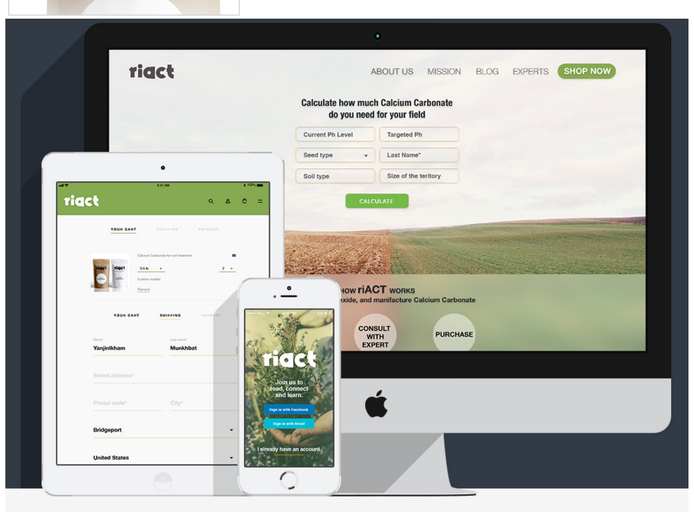
GAEA is composed of three devices: CO2 capturing device; CO2 gas liquidizer; and fluidized-bed reactive crystallizer. The CO2 capturing chamber can capture 136.7 kg of CO2 per day and about 50 tons of CO2 per year (Climeworks, 2017). The captured CO2 is then processed into 63 kg of calcium carbonate per day and about 23 tons of calcium carbonate per year (US9637392B2, 2017).
The "riA" portion of the name is "air" in reverse and represents the business' potential to reverse air pollution. The "ACT" portion of the name stands for Air Capturing Technology, which refers to the DAC technology used to combat greenhouse gas emissions. riACT developed GAEA, a DAC system based on existing technologies to capture CO2 from ambient air and process it into calcium carbonate (CaCO3). riACT will profit by selling calcium carbonate created by GAEA to residential gardeners, farmers, and contributors of local community gardens to help neutralize the PH levels of acidic soil.

riact

Reverse air pollution through Direct Air Capturing Technology

air — "riA" "air" in reverse

act — Air Capturing Technology

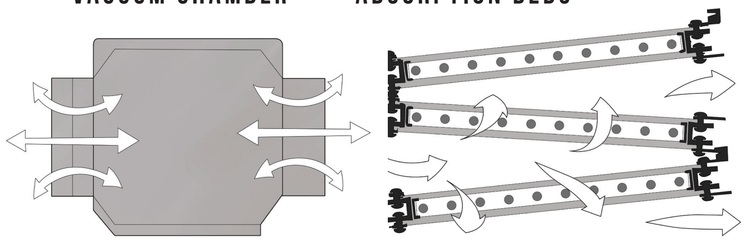


DAC TECHNOLOGY

riACT developed GAEA a DAC system based on existing technologies

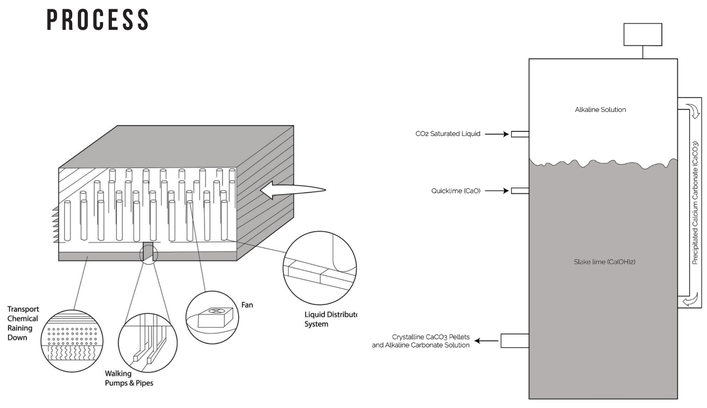
STEP 1
VACUUM CHAMBER

STEP 2
ADSORPTION BEDS



STEP 3
CYCLICAL ADSORPTION AND DESORPTION PROCESS

STEP 4
MINERALIZATION OF CO2



SUSTAINABILITY

Sustainbility Impact from 1unit

ESTIMATED AMOUNT OF CO2 COLLECTED VACUUM CHAMBER

136.7 kg
Captured CO2 per day

50 tonnes
Captured CO2 per year

Equation:
1 DAC unit collects = 136.7 kg-CO2/per day
136.7kg-CO2/per day x 365 days = 49,895.5 kg-per year
49,895.5 kg-per year ≈ 50 tonnes-CO2/per year

ESTIMATED AMOUNT OF CALCIUM CARBONATE MINERALIZED

63 kg
CaCO3 per day

23 tonnes
CaCO3 per year

Equation:
136.7 kg-CO2/day = 360 kg-Ca/m2/day (Ca(OH)2)
360 kg-Ca/m2/day x 0.175 = 63 kg-CaCO3/per day
63 kg-CaCO3/per day x 365 days = 22,995 kg-per year
22,995 kg-per year ≈ 23 tonnes-CaCO3/per year

CONCLUSION

It is all about community collaboration

riACT will contribute to the reduction of greenhouse gas emissions and stagnate the rise in global temperature by utilizing GAEA, a DAC system, to remove CO2 from ambient air and convert it into lime. The lime will then be used to treat acidic soil created by the effects of greenhouse gas emissions. Carbon-based businesses, like riACT, have the potential to establish markets that will fund research and advance DAC technology. With further study, we can enhance carbon capturing processes, cut manufacturing and maintenance costs, and decrease the energy needed for power. However, as DAC technology advances, the possibility of increased burning of fossil fuels is a real concern. We need to make sure we decrease our carbon footprint as carbon capturing technology evolves. Only then will we have a chance at stopping global warming and mitigating our emission of greenhouse gases.

inspiration
ideation
implementation

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